EXPERIMENTS WITH CRUDE CARBOLIC ACID AS A LARVICIDE IN BRITISH GUIANA

BY

K. S. WISE, M.B., B.S., B.Sc. (Lond.), D.P.H.

GOVERNMENT BACTERIOLOGIST

AND

E. P. MINNETT, M.D. (Brux.), D.P.H. (Camb.), D.T.M. & H. (Camb.)

ASSISTANT GOVERNMENT BACTERIOLOGIST

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CRUDE CARBOLIC ACID AS A LARVICIDE

The question of the choice of a larvicide in British Guiana is somewhat difficult. Paraffin, either in its pure or crude state, and even heavy petroleum oil, is useless, except in a few isolated cases. Most of the ponds and small temporary areas of water must be treated with a soluble form of larvicide, as owing to the strong wind always blowing, also the absolutely flat open nature of the ground, anything floating on the surface, such as oil is quickly blown away to one side and evaporated before its asphyxiating properties come into play.

In the case of large areas of water such as drainage trenches, the breeding of larvae is kept within bounds by keeping them well stocked with the small fishes known locally as 'Cockerbellies,' and clearing away all floating vegetation as far as possible. But these fish are in many cases unable to gain access to the small depressions in the land holding temporary water, and places such as recently dug pits for earth to burn, footprints of cows, etc.; it is in these cases that we have now adopted crude carbolic acid as combining the most important features of cheapness and efficiency.

It was employed with complete success during the camping out of the Local Forces. A few days before the camp was pitched the ground was thoroughly surveyed especially to windward of the camp site. All puddles were, as far as possible, connected by narrow

drains into deepish pits and treated with crude carbolic acid, isolated areas were treated separately, and the large trenches to windward especially cleared from vegetation and well stocked with fish.

In most of the small pits, when treated with carbolic acid, the larvae were seen to die in about an hour, but in the case of pupae the time was much longer (frequently as much as twenty-four hours), but usually when examined carefully the following day after treatment no larvae or pupae were seen alive.

We are inclined to the belief that, in the case of a temporary small collection of water, if crude carbolic acid is applied it does not evaporate to any large extent but concentrates as the puddle dries up, and further, that, having dried up, the ground is sufficiently impregnated with the carbolic acid to render water deposited later by a shower of rain fatal to larvae. Sufficient data have, however, not yet been collected to make an authoritative statement on this point. As will be seen by the laboratory experiments herewith, a dilution of 1 in 20,000 is efficient as regards all larvae inside two hours, but in the case of pupae a much longer time is required—probably owing to the fact that pupae possesses a thick chitinous shell and have no alimentary canal into which to take the poison.

For use we calculate one teaspoonful to every two cubic feet of water or one ounce to 16 cubic feet; this gives a dilution of about 1 in 16,000, and allows a fair margin of safety to cover errors in calculation.

The crude carbolic acid containing all its impurities, such as cresol, rosolic acid, oily and tarry substances, is much more efficient than the purified, more highly soluble product, possibly owing to its sticky nature making it more adherent to the larvae and pupae, also no doubt in a few cases blocking up the syphon tubes.

Experiment II bears out this point. In this series of experiments the crude carbolic acid was first freed from its oily and tarry substances by filtration before use. As will be seen in this form, the toxic effects are developed more quickly, but it is not efficient in such high dilutions; as in a dilution of 1 in 20,000 half the larvae and all the pupae were alive at the expiration of three hours; whereas in the case of crude carbolic acid it was fatal to all the larvae in one and a quarter hours.

With regard to the effects on animals, the dilution used would not be fatal, as 12½ gallons would only contain one drachm (60 minims) of carbolic acid—not a very serious thing for an animal capable of drinking 12½ gallons at one drink.

The water treated in this manner has a distinctly tarry odour, and animals do not drink it at all readily on this account; and, further, the water treated in this way acquires a blackish colour.

We have not, however, found crude carbolic acid useful for spraying large areas with a Mackenzie spray, owing to the fact that some of its constituents are not soluble in water; but by constantly stirring the mixture in a bucket during the process a fairly satisfactory distribution can be obtained. This, however, requires supervision. When a large area of ground, containing a number of small holes, such as footprints, has to be treated it has been found more satisfactory to use preparations more freely miscible with water, such as Cyllin, Chloro-Naphtholeum or Sanitas Okol, although the expense is much greater.

Experiment No. 1.—Crude Carbolic Acid

No.	Dilution	Larvae		Pupae	
		Condition of larvae	Exposure time	Condition of pupae	Exposure time
1	1 in 250	All dead	¾ hour	All dead	¾ hour
2	1 in 500	,,	,,	,,	,,
3	1 in 750	,,	,,	,,	,,
4	1 in 1000	,,	,,	,,	,,
5	1 in 1500	,,	,,	,,	,,
6	1 in 2000	,,	1 hour	,,	10 hours
7	1 in 4000	,,	,,	,,	12 hours
8	1 in 6000	,,	,,	,,	,,
9	1 in 8000	,,	,,	,,	,,
10	1 in 10000	,,	,,	,,	,,
11	1 in 12000	,,	,,	,,	17 hours
12	1 in 14000	,,	,,	,,	,,
13	1 in 16000	,,	1½ hours	,,	,,
14	1 in 20000	,,	,,	,,	,,
15	1 in 25000	,,	24 hours	1 alive only	24 hours
16	1 in 30000	6 alive	,,	2 alive	,,
17	1 in 40000	All alive	,,	All alive	,,
18	1 in 50000	,,	,,	,,	,,
19	1 in 60000	,,	,,	,,	,,

Experiment No. 2.—Filtered Carbolic Acid

No.	Dilution	Larvae		Pupae	
		Condition of Larvae	Exposure time	Condition of Pupae	Exposure time
1	1 in 25000	All alive	24 hours	All alive	24 hours
2	1 in 30000	,,	,,	,,	,,
3	1 in 40000	,,	,,		,,
4	1 in 50000	,,	,,	,,	,,
5	1 in 60000	,,	,,	,,	,,

Experiment No. 3.—Pure Medicinal Carbolic Acid

No.	Dilution	Larvae		Pupae	
		Condition of Larvae	Exposure time	Condition of Pupae	Exposure time
1	1 in 15000	Part killed	¾ hour	All alive	1 hour
2	1 in 20000	Half alive	3 hours	,,	3 hours

Varieties of larvae and pupae used :—

Culicines—Culex fatigans, Stegomyia fasciata, Culicelsa taeniorhynchus.

Anophelines—Cellia albipes, C. argyrotarsus.

Numbers used constant in each experiment :—

Larvae 100

Pupae 20